

corrected to the 50-year period, but not smoothed, of these stations, as given in the MONTHLY WEATHER REVIEW, Supplement No. 34. At 8 of the 32 stations the dry period comes in the 14-day period, July 30 to August 12. At 31 of the 32 stations in this section of the country the period when there is normally less rain, July 16–August 12, comes at a time when the corn is capable of using more rain to the greatest advantage.

For these 23 stations where the dry period occurs July 16–29, the average precipitation for the 14-day period, July 2–15, is 1.72 inches; for July 16–29, 1.43 inches; and for July 30–August 12, 1.59 inches. The first 14-day period has 0.30 inch more rain than the second, and 0.13 more than the third. The third period has 0.17 inch more than the second.

Professor Smith also found that when the July rainfall of these 8 States averaged less than 3.4 inches, the average yield of corn per acre was 10 bushels less than when the rainfall averaged 4.4 inches or more. On this proportion of 1 inch of rain increasing the average yield per acre by 10 bushels, since the forepart of July has 0.30 inch more rain on the average than the latter part, it would be an advantage of 3 bushels per acre to have the critical period of corn come 10 to 15 days earlier.

By either planting earlier, or developing an earlier maturing variety of corn, the crop on the 50,000,000 acres that are usually planted to corn in these States could be increased 150,000,000 bushels. At a price of 50 cents per bushel the value of the corn crop would be increased by \$75,000,000.

The period July 16–29 is not only the driest of the 3 periods that have been compared but at most of the stations it is the driest 14-day period of the growing season. At Terre Haute, Ind., it is the driest from January 29 to October 7; at St. Louis, Mo., Springfield, Ill., and Indianapolis, Ind., it is the driest from February 12 to October 7, while at Cairo, Ill., it is the third driest of the year. At

the remainder of the stations it is the driest 14-day period from approximately May 1 to September 1.

TABLE 1.—Average rainfall at critical period of corn
Where the dry period is July 16–29

Stations	July 2-15	July 16-29	July 30-Aug. 12
Topeka, Kans.	2.07	1.80	1.97
Wichita, Kans.	1.62	1.29	1.68
Iola, Kans.	1.81	1.62	1.73
Lincoln, Nebr.	1.84	1.59	1.76
Kansas City, Mo.	2.08	1.65	1.72
St. Joseph, Mo.	1.99	1.36	1.72
Columbia, Mo.	1.68	1.45	1.48
Hannibal, Mo.	1.47	1.30	1.54
St. Louis, Mo.	1.41	1.23	1.33
Sioux City, Iowa	1.76	1.55	1.56
Charles City, Iowa	1.90	1.58	1.64
Keokuk, Iowa	1.66	1.48	1.61
Davenport, Iowa	1.89	1.24	1.56
Chicago, Ill.	1.58	1.44	1.47
Peoria, Ill.	1.73	1.49	1.49
Springfield, Ill.	1.48	1.13	1.40
Cairo, Ill.	1.38	1.20	1.50
Ft. Wayne, Ind.	1.79	1.41	1.63
Royal Center, Ind.	2.05	1.31	1.52
Indianapolis, Ind.	1.76	1.37	1.59
Terre Haute, Ind.	1.55	1.30	1.42
Columbus, Ohio	1.78	1.49	1.67
Lexington, Ky.	1.64	1.60	1.63
Average	1.73	1.43	1.60

Where the dry period is July 30–Aug. 12

Concordia, Kans.	1.50	1.86	1.34
Des Moines, Iowa	1.61	1.66	1.47
Dubuque, Iowa	2.19	1.56	1.45
Springfield, Mo.	1.81	2.03	1.75
Evansville, Ind.	1.66	1.52	1.38
Louisville, Ky.	1.92	1.45	1.41
Dayton, Ohio	1.58	1.43	1.34
Omaha, Nebr.	1.60	1.64	1.51
Average	1.74	1.65	1.41

Where the dry period is July 2–16

Cincinnati, Ohio	1.47	1.49	1.54
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ANALYSES OF THE PRECIPITATIONS AT MOUNT VERNON, IOWA, FOR 1932–33¹

By LEONARD HINES

[Cornell College, Mount Vernon, Iowa, August 1933]

These analyses of the precipitations at Mount Vernon, Iowa, were made in the chemical laboratories of Cornell College by Leonard Hines, under the direction of Dr. Nicholas Knight. There were samples both of rain and of snow.

Mount Vernon is a village of about 1,700 population, exclusive of the college, and is without factories of any kind. The precipitations were collected in clean granite pans, located in an open space, away from any source of contamination and kept in glass stoppered bottles. The samples were always free from color. Under the direction of Dr. N. Knight, the precipitations here have been analyzed continuously for 25 years.

Ordinarily, after the coal fires are started in the fall, the precipitations show a small amount of sulphate. The SO₂ from the sulphur in the coal oxidizes in the air to SO₃. The past 2 years show a much smaller amount of sulphate, merely traces and less during the past year. During these years of the depression, the people have burned wood and much less coal.

We have considered 12 inches of snow the equivalent of 1 inch of rain.

Special pains were taken with the chloride determination. It has been found necessary to make a correction of 3.55 parts per million from the reading to allow for the formation of the color. In each case, 6 drops of the potassium chromate indicator were used.

The precipitations usually occur when the wind is either from the west or the south, which signifies that the salt is carried from the Atlantic Ocean or the Gulf of Mexico.

The phenol sulphonic method was used in the determination of the nitrates. In general, we followed in our analyses the sixth edition of Standard Methods of Water Analysis, published by the American Health Association.

Table 1 gives the parts of the various substances in 1,000,000 parts of the water and table 2 gives the pounds per acre. One inch of rainfall on an acre weighs 226,875 pounds.

¹ See also Analysis of the Precipitation of Rains and Snows at Mount Vernon, Iowa [1931–32], by Williams and Beddow, MONTHLY WEATHER REVIEW, May 1933, vol. 61, pp. 141–142.

TABLE 1.—Parts per million

No.	Date	Amount	Precipitation	Ni- trates	Ni- trites	Free NH ₃	Alb. NH ₃	SO ₄	Chlo- rides
		<i>Inches</i>							
1	June 18	1.8	Rain	0.01	Trace	0.32	0.04		2.5
2	June 19	.1	do	.01		.20	.09		6.1
3	June 26	.35	do	.01		.32	.14		8.65
4	Sept. 12	.7	do	.01		.40	.09		12.75
5	do	.5	do		0.09	.28	.17		8.65
6	Sept. 20	.4	do	.02	.20	.14	.19		8.75
7	Oct. 3	.7	do	.03	.10	.21	.23		5.1
8	Oct. 10	1.0	do	.07	.11	.05	.09		5.1
9	Oct. 25	.55	do		.55	.10	.11		8.65
10	Nov. 4	.2	do	.14	.03	.30	.10		3.75
11	Nov. 8	1.0	do	.01	.09	.12	.08		1.55
12	Nov. 9	.15	do						5.1
13	Nov. 12	.7	do	.04	.14	.13	.09		1.55
14	Dec. 13	.7	do	.11	.08	.15	.09		8.75
15	Dec. 11	4.0	Snow	.07	.10	.04	.08		3.55
16	Dec. 23	.5	Rain		.04	.43	.04		7.1
17	Dec. 25	.7	do		.04				4.1
18	Jan. 18	.2	do	.25	.25	.08	.04		1.1
19	Jan. 27	4.0	Snow	.03	.09	.20	.32		1.55
20	Feb. 8	4.0	do	.01	.09	.08	.16		2.8
21	Mar. 19	.7	Rain	.01	.07	.09	.11		1.6
22	Mar. 20	3.0	Snow	.07	.01	.11	.09		2.9
23	Mar. 24	4.0	do	.02	.01	.17	.03		1.6
24	Mar. 29	.65	Rain	.04		.10	.07		5.1
25	Mar. 30	1.75	do	.04	.01	.09	.10		5.1
26	Apr. 5	.7	do	.07	.01	.14	.13		7.3
27	Apr. 9	.25	do	.12	.03	.17	.09		7.7
28	Apr. 13	.35	do	.03	.07	.09	.04		4.5
29	Apr. 30	.65	do	.07	.07	.14	.15		5.1
30	May 2	1.25	do	.07	.15	.09	.11		5.1
31	May 5	.6	do	.09	.13	.05	.07		1.55
32	May 7	.75	do	.02	.09	.15	.14		5.1
33	May 12	1.4	do	.04	.03	.30	.04		2.05
34	May 15	.2	do	.07	.07	.04	.19		2.4
35	May 16	.45	do	.11	.07	.09	.07		2.4
36	May 18	.25	do	.10	.10	.13	.30		8.2
37	May 19	.7	do	.04	.06	.09	.17		7.55
38	May 20	.5	do	.11	.03	.04	.09		2.4
39	May 21	.25	do	.07	.09	.11	.08		2.3
40	May 26	.35	do	.11	.07	.04	.06		3.6
41	May 27	.40	do	.06	.09	.09	.10		5.5
42	May 30	.65	do	.06	.09	.03	.10		5.0
43	June 4	.7	do	.07	.03	.11	.07		2.8

TABLE 2.—Data from table 1 converted to pounds per acre

[1 inch of rain over 1 acre=226876]

No.	Nitrates	Nitrites	Free NH ₃	Alb. NH ₃	Sulphur	Chlorides
1	0.004083		0.130680	0.016335		1.020937
2	.000226		.004537	.002041		.138390
3	.007940		.019009	.011116		.686861
4	.001588		.063524	.014293		2.024853
5		0.010209	.031762	.019284		.981230
6	.001815	.018150	.012705	.017242		.794062
7	.004764	.015880	.015881	.036526		.809941
8	.015881	.024956	.011343	.020418		1.157062
9		.068629	.012477	.013725		1.079155
10	.006352	.001361	.013613	.004537		.170156
11	.002268	.020418	.027425	.018150		.351656
12						.073558
13	.006352	.022233	.020645	.014293		.246158
14	.017469	.012705	.023821	.014293		1.389605
15	.005293	.006506	.003025	.006050		.268468
16		.004537	.048777	.004537		.805402
17		.006352				.651129
18	.011343	.003630	.003630	.001815		.049912
19	.002268	.006806	.015125	.024200		.117218
20	.000756	.006806	.006050	.012100		.211750
21	.001588	.011116	.014293	.017469		.254099
22	.003970	.000567	.006249	.005104		.164515
23	.001512	.000756	.012856	.002268		.121000
24	.006598		.014746	.010322		.752026
25	.015881	.003970	.035732	.039703		2.024863
26	.011116	.001588	.022233	.006435		1.159327
27	.006806	.001701	.009642	.005104		.436736
28	.002382	.004764	.007146	.007146		.357327
29	.008734	.007940	.017469	.018717		.636383
30	.019851	.042534	.025523	.031195		1.446329
31	.012251	.017696	.006806	.009528		.210993
32	.003403	.015314	.025523	.023821		.867800
33	.012705	.008507	.095287	.012705		.651131
34	.003176	.003176	.001815	.008621		.108900
35	.011230	.007146	.009188	.007146		.245023
36	.005671	.005671	.007373	.017015		.465095
37	.006352	.009528	.014293	.026968		1.160630
38	.012478	.003403	.004537	.010209		.108900
39	.003970	.005104	.006239	.004537		.130453
40	.008734	.003176	.003176	.004764		.285861
41	.009075	.008167	.008167	.009075		.499125
42	.008848	.013272	.004424	.014746		.737340
43	.011116	.004764	.017469	.011116		.444673

EXCESSIVE RAIN AND FLOOD IN THE LOS ANGELES, CALIF., AREA

By LAWRENCE H. DAINGERFIELD

[Weather Bureau Office, Los Angeles, Calif., Mar. 23, 1934]

A pressure distribution developed over the Pacific Ocean on December 29, 1933, closely resembling the "Westerly type" as defined by Thomas R. Reed in the MONTHLY WEATHER REVIEW of December 1932. During the following 4 days the pressure map was similar to Reed's "Westerly type" of December 22, 1931-January 2, 1932, which was attended by moderately heavy rain over the Los Angeles area on December 26, 28, and 29, 1931, and heavy-to-excessive precipitation over coastal areas to northward.

The disturbances of December 1931 and December 1933 possessed another common characteristic, namely, the appearance in each instance of a greatly modified depression some hundreds of miles inland, east or southeast of the parent storm, during the closing period of the major cyclone but with this difference. In the case of the 1931 disturbance, the subsequent modified depression appeared over Utah, western Wyoming, and western Colorado, while in the latter case the succeeding disturbance was over Arizona and New Mexico. Whether or not the succeeding disturbances were the "sheared-off tops" of the much vaster ocean cyclones, described by E. H. Bowie as applicable to, and accounting for, the reappearance lows of Alaskan Gulf depressions to the east or leeward of the near-coastal mountain ranges of Alaska and British Columbia, or possibly "secondaries" or even new developments, it is difficult to know with certainty.

In the case of the Los Angeles storm of December 1933, which was of the North Pacific type described by Dean Blake,¹ the breaking down, or far southward movement,

of the protecting North Pacific high is obvious, with one remnant near the Hawaiian Islands and another portion over Lower California, Sonora, and Sinaloa, Mexico, facilitating the southern extension of the Alaskan Gulf disturbance over the Pacific Ocean to somewhat below the latitude of Los Angeles. This movement was attended by a warm, moist front, believed to have had its origin over tropical or semitropical waters.

Under this pressure distribution, the rather localized, but moisture-bearing, warm front advanced northeastward or northward from its tropical or semitropical origin and crossed the coast line of Los Angeles, Orange, and the upper extremity of San Diego Counties.

The precipitation, generally, was only moderately heavy over the coastal area named, ranging from 2 to 4 inches, except from Santa Monica westward, where the abrupt, steep southerly slope of the Santa Monica Mountains, dropping sharply to the sea, exerted a profound influence, referred to later, on the rain-bearing wind.

Before the moist air reached the slopes of the San Gabriel and San Bernardino Mountains, however, it was under-run by a cold easterly wind which, obviously, largely increased the rainfall over the valley lands and lower foothill regions between the coast and mountains. In this connection Floyd D. Young, in charge of the Pacific Coast fruit-frost work of the Bureau, with head office in Pomona, Calif., says:

So far as the local area around Pomona is concerned, I believe the general conditions which prevailed here throughout the storm period were practically the same as those in Los Angeles. The outstanding feature of the storm here, or at least the feature which impressed me most forceably, was a strong, relatively cool, sus-

¹ MONTHLY WEATHER REVIEW, 61, 223, 1933.